

S1: [Ni,Fe]-CODH sequences found in IMG database as of October 2011

Gene ID	Product Name	Genome
648713299	carbon-monoxide dehydrogenase, catalytic subunit	Acetivibrio cellulolyticus CD2 DSM 1870
648129356	carbon-monoxide dehydrogenase, catalytic subunit	Acetohalobium arabaticum Z-7288 DSM 5501 CooS-1
648129663	carbon-monoxide dehydrogenase, catalytic subunit	Acetohalobium arabaticum Z-7288 DSM 5501 CooS-2
640784597	carbon-monoxide dehydrogenase, catalytic subunit	Alkaliphilus metalliredigens QYMF CooS-1
640782882	carbon-monoxide dehydrogenase, catalytic subunit	Alkaliphilus metalliredigens QYMF CooS-2
640782069	carbon-monoxide dehydrogenase, catalytic subunit	Alkaliphilus metalliredigens QYMF CooS-3
646358364	carbon-monoxide dehydrogenase, catalytic subunit	Ammonifex degensii KC4
638158420	carbon monoxide dehydrogenase, catalytic subunit (cooS)	Archaeoglobus fulgidus VC-16 DSM 4304 CooS-1
638158998	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Archaeoglobus fulgidus VC-16 DSM 4304 Cdh-1
638157644	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Archaeoglobus fulgidus VC-16 DSM 4304 Cdh-2
643803370	carbon-monoxide dehydrogenase, catalytic subunit	Azotobacter vinelandii DJ ATCC BAA-1303
644139022	carbon-monoxide dehydrogenase, catalytic subunit	Blautia hansenii VPI C7-24 DSM 20583 CooS-1
644139338	carbon-monoxide dehydrogenase, catalytic subunit	Blautia hansenii VPI C7-24 DSM 20583 CooS-2
644154642	carbon-monoxide dehydrogenase, catalytic subunit	Blautia hydrogenotrophica DSM 10507 CooS-1
644157708	carbon-monoxide dehydrogenase, catalytic subunit	Blautia hydrogenotrophica DSM 10507 CooS-2
644156739	carbon-monoxide dehydrogenase, catalytic subunit	Blautia hydrogenotrophica DSM 10507 CooS-3
644189211	carbon-monoxide dehydrogenase, catalytic subunit	Bryantella formatixigenes I-52 DSM 14469 CooS-1
644186543	carbon-monoxide dehydrogenase, catalytic subunit	Bryantella formatixigenes I-52 DSM 14469 CooS-2
649725251	carbon-monoxide dehydrogenase, catalytic subunit	Caldicellulosiruptor hydrothermalis 108
649757735	carbon-monoxide dehydrogenase, catalytic subunit	Caldicellulosiruptor kristjanssonii 177R1B DSM 12137
650233746	carbon-monoxide dehydrogenase, catalytic subunit	Caldicellulosiruptor lactoaceticus 6A DSM 9545
640494759	carbon-monoxide dehydrogenase, catalytic subunit	Caldicellulosiruptor saccharolyticus DSM 8903
640930194	carbon-monoxide dehydrogenase, catalytic subunit	Campylobacter concisus 13826
640871500	carbon-monoxide dehydrogenase, catalytic subunit	Campylobacter curvus 525.92
646162341	carbon monoxide dehydrogenase 1	Campylobacter gracilis RM3268
641593682	carbon-monoxide dehydrogenase, catalytic subunit	Candidatus Desulforudis audaxviator MP104C CooS-1
641592958	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Candidatus Desulforudis audaxviator MP104C Cdh-1
641613835	carbon-monoxide dehydrogenase, catalytic subunit	Candidatus Korarchaeum cryptofilum OPF8
642557948	Similar to CO dehydrogenase/acetyl-coA synthase beta subunit (acsA)	Candidatus Kuenenia stuttgartiensis CooS-1
640868110	carbon-monoxide dehydrogenase, catalytic subunit	Candidatus Methanoregula boonei 6A8 Cdh-1
640868606	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Candidatus Methanoregula boonei 6A8 CooS-1
647641896	carbon-monoxide dehydrogenase, catalytic subunit	Carboxydibrachium pacificum JM DSM 12653

637752792	carbon-monoxide dehydrogenase, catalytic subunit	Carboxydothermus hydrogenoformans Z-2901 CooS-V
637753488	carbon-monoxide dehydrogenase, catalytic subunit	Carboxydothermus hydrogenoformans Z-2901 CooS-IV
637752843	carbon-monoxide dehydrogenase, catalytic subunit	Carboxydothermus hydrogenoformans Z-2901 CooS-II
637754564	carbon-monoxide dehydrogenase, catalytic subunit	Carboxydothermus hydrogenoformans Z-2901 CooS-I
642719837	Carbon-monoxide dehydrogenase (acceptor)	Chlorobaculum parvum NCIB 8327
639764751	Carbon-monoxide dehydrogenase (acceptor)	Chlorobium phaeobacteroides DSM 266
643914470	carbon monoxide dehydrogenase	Clostridiales sp. 1_7_47FAA
637175758	Carbone-monoxide dehydrogenase, beta chain	Clostridium acetobutylicum ATCC 824 CooS-1
637178154	Carbon monoxide dehydrogenase, catalytic subunit (cooS)	Clostridium acetobutylicum ATCC 824 CooS-2
642161933	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium bartlettii DSM 16795 CooS-1
642162500	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium bartlettii DSM 16795 CooS-2
640775295	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium beijerinckii NCIMB 8052 CooS-1
640773260	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium beijerinckii NCIMB 8052 CooS-2
641407361	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium bolteae ATCC BAA-613
643809489	carbon monoxide dehydrogenase	Clostridium botulinum A2 Kyoto-F CooS-1
643810364	carbon monoxide dehydrogenase	Clostridium botulinum A2 Kyoto-F CooS-2
643846512	carbon monoxide dehydrogenase	Clostridium botulinum Ba4 657 CooS-1
643847471	carbon monoxide dehydrogenase	Clostridium botulinum Ba4 657 CooS-2
642087855	carbon monoxide dehydrogenase	Clostridium botulinum Bf
640847354	carbon monoxide dehydrogenase	Clostridium botulinum BoNT/A1 ATCC 19397 CooS-1
640848138	carbon monoxide dehydrogenase	Clostridium botulinum BoNT/A1 ATCC 19397 CooS-2
641660414	carbon monoxide dehydrogenase	Clostridium botulinum BoNT/A3 Loch Maree CooS-1
641661287	carbon monoxide dehydrogenase	Clostridium botulinum BoNT/A3 Loch Maree CooS-2
641654483	carbon monoxide dehydrogenase	Clostridium botulinum BoNT/B1 Okra CooS-1
641655347	carbon monoxide dehydrogenase	Clostridium botulinum BoNT/B1 Okra CooS-2
645587100	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium botulinum D 1873
646967577	carbon monoxide dehydrogenase	Clostridium botulinum F 230613 CooS-1
640854619	carbon monoxide dehydrogenase	Clostridium botulinum F Langeland CooS-1
640855445	carbon monoxide dehydrogenase	Clostridium botulinum F Langeland CooS-2
642083741	carbon monoxide dehydrogenase	Clostridium botulinum NCTC 2916 CooS-1
642083651	carbon monoxide dehydrogenase	Clostridium botulinum NCTC 2916 CooS-2
640573808	carbon monoxide dehydrogenase beta subunit	Clostridium botulinum type A - Hall CooS-1
642089439	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium botulinum type C - Eklund
645610865	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium carboxidivorans P7 DSM 15243 CooS-1
645612461	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium carboxidivorans P7 DSM 15243 CooS-2
645613653	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium carboxidivorans P7 DSM 15243

		CooS-3
648015111	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium carboxidivorans P7 DSM 15243 CooS-4
643607368	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium cellulolyticum H10 CooS-1
643609818	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium cellulolyticum H10 CooS-2
648147312	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium cellulosvorans 743B ATCC 35296 CooS-1
648145679	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium cellulosvorans 743B ATCC 35296 CooS-2
648144639	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium cellulosvorans 743B ATCC 35296 CooS-3
648143498	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium cellulosvorans 743B ATCC 35296 CooS-4
640155919	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile 630 - epidemic type X CooS-1
640156483	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile 630 - epidemic type X CooS-2
647016785	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile BI9 CooS-1
647017332	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile BI9 CooS-2
642840002	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile CIP 107932 CooS-1
642838167	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile CIP 107932 CooS-2
647531510	carbon-monoxide dehydrogenase (acceptor)	Clostridium difficile NAP07 CooS-1
647528689	carbon-monoxide dehydrogenase (acceptor)	Clostridium difficile NAP07 CooS-2
647511425	carbon-monoxide dehydrogenase (acceptor)	Clostridium difficile NAP08 CooS-1
647508431	carbon-monoxide dehydrogenase (acceptor)	Clostridium difficile NAP08 CooS-2
642841936	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile QCD-23m63 CooS-1
642840930	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile QCD-23m63 CooS-2
638869554	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium difficile QCD-32g58 CooS-1
638870073	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium difficile QCD-32g58 CooS-2
642243859	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile QCD-37x79 NAP1a/001 CooS-1
642243769	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile QCD-37x79 NAP1a/001 CooS-2
642229198	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile QCD-63q42 CooS-1
642229464	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile QCD-63q42 CooS-2
645110909	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile QCD-66c26 CooS-1
645111408	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile QCD-66c26 CooS-2
642236500	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile QCD-76w55 NAP1 CooS-1
642234736	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile QCD-76w55 NAP1 CooS-2
642238403	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile QCD-97b34 NAP1b/006 CooS-1
642240118	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile QCD-97b34 NAP1b/006 CooS-2

646336115	putative oxidoreductase, acetyl-CoA synthase subunit	Clostridium difficile R20291 CooS-1
646336578	putative bifunctional carbon monoxide dehydrogenase/acetyl-CoA synthase	Clostridium difficile R20291 CooS-2
643117552	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium hiranonis TO-931 DSM 13275
640859387	hypothetical protein	Clostridium kluyveri DSM 555
643576133	hypothetical protein	Clostridium kluyveri NBRC 12016
648088651	anaerobic-type carbon monoxide dehydrogenase	Clostridium ljungdahlii PETC DSM 13528 CooS-1
648091499	carbon monoxide dehydrogenase	Clostridium ljungdahlii PETC DSM 13528 CooS-2
648089530	carbon monoxide dehydrogenase catalytic subunit	Clostridium ljungdahlii PETC DSM 13528 CooS-3
643115070	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium nexile DSM 1787
639733200	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium novyi NT
645657429	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium papyrosolvens DSM 2782 CooS-1
645655030	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium papyrosolvens DSM 2782 CooS-2
648122771	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium saccharolyticum WM1 DSM 2544
642851225	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium sporogenes ATCC 15579 CooS-1
642850320	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium sporogenes ATCC 15579 CooS-2
649671267	carbon monoxide dehydrogenase 1 (codh 1)	Clostridium sticklandii DSM 519
637385980	carbon monoxide dehydrogenase beta subunit	Clostridium tetani Massachusetts E88
640108221	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium thermocellum ATCC 27405
645641338	carbon-monoxide dehydrogenase, catalytic subunit	Clostridium thermocellum DSM 2360
648675575	carbon-monoxide dehydrogenase, catalytic subunit	delta proteobacterium NaphS2 CooS-1
648673357	carbon-monoxide dehydrogenase, catalytic subunit	delta proteobacterium NaphS2 CooS-2
639154103	Carbon-monoxide dehydrogenase, catalytic subunit	delta proteobacterium sp. MLMS-1 CooS-1
639157444	Carbon-monoxide dehydrogenase, catalytic subunit	delta proteobacterium sp. MLMS-1 CooS-2
639153979	Carbon-monoxide dehydrogenase, catalytic subunit	delta proteobacterium sp. MLMS-1 CooS-3
639157084	Carbon-monoxide dehydrogenase, catalytic subunit	delta proteobacterium sp. MLMS-1 CooS-4
639158104	Carbon-monoxide dehydrogenase, catalytic subunit	delta proteobacterium sp. MLMS-1 CooS-5
648111450	carbon-monoxide dehydrogenase, catalytic subunit	Desulfarculus baarsii 2st14 DSM 2075
643533854	carbon-monoxide dehydrogenase, catalytic subunit	Desulfatibacillum alkenivorans AK-01 CooS-1
643535560	carbon-monoxide dehydrogenase, catalytic subunit	Desulfatibacillum alkenivorans AK-01 CooS-2
643560799	carbon-monoxide dehydrogenase, catalytic subunit	Desulfitobacterium hafniense DCB-2 CooS-4
643563716	carbon-monoxide dehydrogenase, catalytic subunit	Desulfitobacterium hafniense DCB-2 CooS-3
643561081	carbon-monoxide dehydrogenase, catalytic subunit	Desulfitobacterium hafniense DCB-2 CooS-2
643562716	carbon-monoxide dehydrogenase, catalytic subunit	Desulfitobacterium hafniense DCB-2 CooS-1
637912396	carbon monoxide dehydrogenase	Desulfitobacterium hafniense Y51 CooS-4
637914218	carbon monoxide dehydrogenase	Desulfitobacterium hafniense Y51 CooS-3
637913947	carbon monoxide dehydrogenase	Desulfitobacterium hafniense Y51 CooS-2
637911405	carbon monoxide dehydrogenase/acetyl-CoA synthase beta subunit	Desulfitobacterium hafniense Y51 CooS-1
643723073	Cdh2	Desulfovobacterium autotrophicum HRM2 DSM 3382 CooS-1

643722831	Cdh1	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-2
643720399	CdhA	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-3
641264056	carbon-monoxide dehydrogenase, catalytic subunit	Desulfococcus oleovorans Hxd3 CooS-1
641265804	carbon-monoxide dehydrogenase, catalytic subunit	Desulfococcus oleovorans Hxd3 CooS-2
645037809	carbon-monoxide dehydrogenase, catalytic subunit	Desulfohalobium retbaense HR100 DSM 5692
645000173	carbon-monoxide dehydrogenase, catalytic subunit	Desulfomicrobium baculatum X DSM 4028
644404981	carbon-monoxide dehydrogenase, catalytic subunit	Desulfonatronospira thiodismutans ASO3-1 CooS-1
644403507	carbon-monoxide dehydrogenase, catalytic subunit	Desulfonatronospira thiodismutans ASO3-1 CooS-2
645034634	carbon-monoxide dehydrogenase, catalytic subunit	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-1
645035189	carbon-monoxide dehydrogenase, catalytic subunit	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-2
645033610	carbon-monoxide dehydrogenase, catalytic subunit	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-3
645036007	carbon-monoxide dehydrogenase, catalytic subunit	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-4
650356635	carbon-monoxide dehydrogenase, catalytic subunit	Desulfotomaculum nigrificans DSM 574 CooS-1
650356975	carbon-monoxide dehydrogenase, catalytic subunit	Desulfotomaculum nigrificans DSM 574 CooS-2
640179826	carbon-monoxide dehydrogenase, catalytic subunit	Desulfotomaculum reducens MI-1
649851318	carbon-monoxide dehydrogenase, catalytic subunit	Desulfovibrio aespoeensis Aspo-2 DSM 10631
637783936	carbon-monoxide dehydrogenase, catalytic subunit	Desulfovibrio alaskensis G20
643581172	carbon-monoxide dehydrogenase, catalytic subunit	Desulfovibrio desulfuricans desulfuricans ATCC 27774
644802844	putative carbon monoxide dehydrogenase	Desulfovibrio magneticus RS-1
644840671	carbon-monoxide dehydrogenase, catalytic subunit	Desulfovibrio salexigens DSM 2638
643540759	carbon-monoxide dehydrogenase, catalytic subunit	Desulfovibrio vulgaris Miyazaki F
639819362	carbon-monoxide dehydrogenase, catalytic subunit	Desulfovibrio vulgaris vulgaris DP4
637123329	carbon monoxide dehydrogenase	Desulfovibrio vulgaris vulgaris Hildenborough
649844314	carbon-monoxide dehydrogenase, catalytic subunit	Desulfurispirillum indicum S5
646845554	carbon-monoxide dehydrogenase, catalytic subunit	Desulfurivibrio alkaliphilus AHT2 CooS-1
646846052	carbon-monoxide dehydrogenase, catalytic subunit	Desulfurivibrio alkaliphilus AHT2 CooS-2
649988639	carbon-monoxide dehydrogenase, catalytic subunit	Desulfurobacterium thermolithotrophum BSA DSM 11699 CooS-1
649989056	carbon-monoxide dehydrogenase, catalytic subunit	Desulfurobacterium thermolithotrophum BSA DSM 11699 CooS-2
644401105	carbon-monoxide dehydrogenase, catalytic subunit	Dethiobacter alkaliphilus AHT1 CooS-1
644400183	carbon-monoxide dehydrogenase, catalytic subunit	Dethiobacter alkaliphilus AHT1 CooS-2
650278314	carbon-monoxide dehydrogenase, catalytic subunit	Eubacterium cellulosolvens 6
644225640	carbon-monoxide dehydrogenase, catalytic subunit	Eubacterium hallii DSM 3353 CooS-1
644228698	carbon-monoxide dehydrogenase, catalytic subunit	Eubacterium hallii DSM 3353 CooS-2
649696910	carbon-monoxide dehydrogenase	Eubacterium limosum KIST612
650306428	carbon-monoxide dehydrogenase	Eubacterium saburreum DSM 3986

646613669	carbon-monoxide dehydrogenase, catalytic subunit	Ferroglobus placidus AEDII12DO DSM 10642 CooS-1
646613484	carbon-monoxide dehydrogenase, catalytic subunit	Ferroglobus placidus AEDII12DO DSM 10642 CooS-2
646611862	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Ferroglobus placidus AEDII12DO DSM 10642 Cdh
649723023	carbon-monoxide dehydrogenase, catalytic subunit	Geobacillus sp. Y4.1MC1
647479848	carbon-monoxide dehydrogenase, catalytic subunit	Geobacillus thermoglucosidasius C56-YS93
642766034	carbon-monoxide dehydrogenase, catalytic subunit	Geobacter bemandjiensis Bem DSM 16622 CooS-1
642767728	carbon-monoxide dehydrogenase, catalytic subunit	Geobacter bemandjiensis Bem DSM 16622 CooS-2
637779194	Carbon-monoxide dehydrogenase, catalytic subunit	Geobacter metallireducens GS-15
643638334	carbon-monoxide dehydrogenase, catalytic subunit	Geobacter sp. FRC-32 CooS-1
643637653	carbon-monoxide dehydrogenase, catalytic subunit	Geobacter sp. FRC-32 CooS-2
637126789	carbon monoxide dehydrogenase subunit	Geobacter sulfurreducens PCA
640548118	carbon-monoxide dehydrogenase, catalytic subunit	Geobacter uraniireducens Rf4
650049856	carbon-monoxide dehydrogenase	Lachnospiraceae bacterium sp. 8_1_57FAA
644969638	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanocaldococcus fervens AG86
646777846	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanocaldococcus infernus ME
638202064	carbon monoxide dehydrogenase, catalytic subunit (cooS)	Methanocaldococcus jannaschii DSM 2661 CooS-1
638201440	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanocaldococcus jannaschii DSM 2661 Cdh-1
646623958	carbon-monoxide dehydrogenase, catalytic subunit	Methanocaldococcus sp. FS406-22 CooS-1
646622637	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanocaldococcus sp. FS406-22 Cdh-1
646367137	carbon-monoxide dehydrogenase, catalytic subunit	Methanocaldococcus vulcanius M7 CooS-1
646367701	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanocaldococcus vulcanius M7 Cdh-1
640537142	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanocella sp. RC-I
637958643	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanococcoides burtonii DSM 6242
640787866	CO dehydrogenase/acetyl-CoA synthase complex, epsilon subunit	Methanococcus aeolicus Nankai-3 Cdh-1
640788579	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanococcus aeolicus Nankai-3 Cdh-2
640166306	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanococcus maripaludis C5
641284174	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanococcus maripaludis C6
640792748	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanococcus maripaludis C7
638196180	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanococcus maripaludis S2
640785975	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanococcus vannielii SB
646858615	carbon-monoxide dehydrogenase, catalytic subunit	Methanococcus voltae A3

648941024		Methanohalobium evestigatum Z-7303 DSM 3721 CooS-1
648055108	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanohalobium evestigatum Z-7303 DSM 3721 Cdh-1
646707218	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanohalophilus mahii SLP DSM 5219
648193898	carbon-monoxide dehydrogenase catalytic subunit	Methanoplanus petrolearius SEBR 4847 DSM 11571
638168741	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanopyrus kandleri AV19 Cdh-1
638168546	carbon monoxide dehydrogenase catalytic subunit	Methanopyrus kandleri AV19 CooS-1
638168739	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanopyrus kandleri AV19 Cdh-2
639700357	carbon-monoxide dehydrogenase, catalytic subunit	Methanosaeta thermophila PT CooS-1
639700232	carbon-monoxide dehydrogenase, catalytic subunit	Methanosaeta thermophila PT Cdh-1
639699298	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosaeta thermophila PT
638178125	carbon-monoxide dehydrogenase, catalytic subunit	Methanosarcina acetivorans C2A CooS-1
638176076	carbon-monoxide dehydrogenase, catalytic subunit	Methanosarcina acetivorans C2A CooS-2
638178729	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosarcina acetivorans C2A Cdh-1
638179299	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosarcina acetivorans C2A Cdh-2
638175771	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosarcina acetivorans C2A Cdh-3
637702351	carbon monoxide dehydrogenase	Methanosarcina barkeri Fusaro DSM 804 CooS-1
637702550	carbon-monoxide dehydrogenase, catalytic subunit	Methanosarcina barkeri Fusaro DSM 804 CooS-2
637699095	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosarcina barkeri Fusaro DSM 804 Cdh-1
637699328	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosarcina barkeri Fusaro DSM 804 Cdh-2
638164581	Carbon monoxide dehydrogenase	Methanosarcina mazei Go1 DSM 3647 CooS-1
638166856	Carbon monoxide dehydrogenase	Methanosarcina mazei Go1 DSM 3647 CooS-2
638166633	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosarcina mazei Go1 DSM 3647 Cdh-1
638165176	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanosarcina mazei Go1 DSM 3647 Cdh-2
643569491	carbon-monoxide dehydrogenase, catalytic subunit	Methanospaerula palustris E1-9c DSM 19958
637896912	carbon-monoxide dehydrogenase, catalytic subunit	Methanospirillum hungatei JF-1 CooS-1
637896327	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanospirillum hungatei JF-1 Cdh-1
648151853	acetyl-CoA decarbonylase/synthase complex, alpha subunit	Methanothermobacter marburgensis Marburg DSM 2133 Cdh-1
648150717	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanothermobacter marburgensis Marburg DSM 2133 Cdh-2
638156260	acetyl-CoA decarbonylase/synthase alpha subunit (EC 1.2.99.2) (IMGterm)	Methanothermobacter thermoautotrophicus Delta H
648711351	CO dehydrogenase/acetyl-CoA synthase complex, epsilon subunit	Methanothermococcus okinawensis IH1
649738126	acetyl-CoA decarbonylase/synthase alpha subunit	Methanothermus fervidus V24S DSM 2088

643105987	carbon-monoxide dehydrogenase, catalytic subunit	Mitsuokella multacida DSM 20544
637829903	carbon-monoxide dehydrogenase, catalytic subunit	Moorella thermoacetica ATCC 39073 CooS-1
637829136	carbon-monoxide dehydrogenase, catalytic subunit	Moorella thermoacetica ATCC 39073 CooS-2
642643233	carbon-monoxide dehydrogenase, catalytic subunit	Natranaerobius thermophilus JW/NM-WN-LF
644432901	carbon-monoxide dehydrogenase, catalytic subunit	Oribacterium sinus F0268
637750481	carbone-monoxide dehydrogenase, beta chain	Pelobacter carbinolicus DSM 2380 CooS-1
637749636	carbon monoxide dehydrogenase subunit	Pelobacter carbinolicus DSM 2380 CooS-2
643742627	carbon-monoxide dehydrogenase, catalytic subunit	Persephonella marina EX-H1
650318436	carbon-monoxide dehydrogenase (acceptor)	Pseudoramibacter alactolyticus ATCC 23263
637927609	carbon-monoxide dehydrogenase, catalytic subunit	Rhodopseudomonas palustris BisB18
637825517	Carbon-monoxide dehydrogenase, catalytic subunit	Rhodospirillum rubrum S1 ATCC 11170
649820639	carbon-monoxide dehydrogenase, catalytic subunit	Ruminococcus albus 7
647432713	carbon-monoxide dehydrogenase, catalytic subunit	Ruminococcus albus 8
646117268	carbon-monoxide dehydrogenase, catalytic subunit	Ruminococcus flavefaciens FD-1
650581529	carbon-monoxide dehydrogenase, catalytic subunit	Ruminococcus obeum A2-162
641008229	carbon-monoxide dehydrogenase, catalytic subunit	Ruminococcus obeum ATCC 29174
646279410	carbon-monoxide dehydrogenase	Ruminococcus sp. 5_1_39BFAA
650191662	carbon-monoxide dehydrogenase, catalytic subunit	Selenomonas artemidis F0399
650270183	carbon-monoxide dehydrogenase, catalytic subunit	Selenomonas sp. oral taxon 137 F0430
646081752	carbon-monoxide dehydrogenase, catalytic subunit	Selenomonas sputigena ATCC 35185
639703649	carbon-monoxide dehydrogenase, catalytic subunit	Syntrophobacter fumaroxidans MPOB CooS-1
639703332	carbon-monoxide dehydrogenase, catalytic subunit	Syntrophobacter fumaroxidans MPOB CooS-2
649975550	carbon-monoxide dehydrogenase, catalytic subunit	Syntrophobutulus glycolicus FIGlyR DSM 8271
646798535	carbon-monoxide dehydrogenase, catalytic subunit	Thermincola potens JR CooS-4
646799559	carbon-monoxide dehydrogenase, catalytic subunit	Thermincola potens JR CooS-3
646798743	carbon-monoxide dehydrogenase, catalytic subunit	Thermincola potens JR CooS-2
646797767	carbon-monoxide dehydrogenase, catalytic subunit	Thermincola potens JR CooS-1
637263228	carbon monoxide dehydrogenase subunit CooS	Thermoanaerobacter tengcongensis MB4T
649801968	carbon monoxide dehydrogenase CooS-like protein subunit	Thermococcus barophilus MP DSM 11836
644808120	Carbon monoxide dehydrogenase (cooS)	Thermococcus gammatolerans EJ3
643421560	carbon-monoxide dehydrogenase, catalytic subunit	Thermococcus onnurineus NA1
647640771	carbon-monoxide dehydrogenase, catalytic subunit	Thermococcus sp. AM4 CooS-1
647639008	carbon-monoxide dehydrogenase, catalytic subunit	Thermococcus sp. AM4 CooS-2
648126397	carbon-monoxide dehydrogenase, catalytic subunit	Thermosediminibacter oceani JW/IW-1228P DSM 16646 CooS-1
648126845	carbon-monoxide dehydrogenase, catalytic subunit	Thermosediminibacter oceani JW/IW-1228P DSM 16646 CooS-2
648126808	carbon-monoxide dehydrogenase, catalytic subunit	Thermosediminibacter oceani JW/IW-1228P DSM 16646 CooS-3
640207875	carbon-monoxide dehydrogenase, catalytic subunit	Thermosinus carboxydivorans Nor1 CooS-1
640208322	carbon-monoxide dehydrogenase, catalytic subunit	Thermosinus carboxydivorans Nor1 CooS-2
649882823	carbon-monoxide dehydrogenase, catalytic subunit	Thermovibrio ammonificans HB-1 DSM 15698

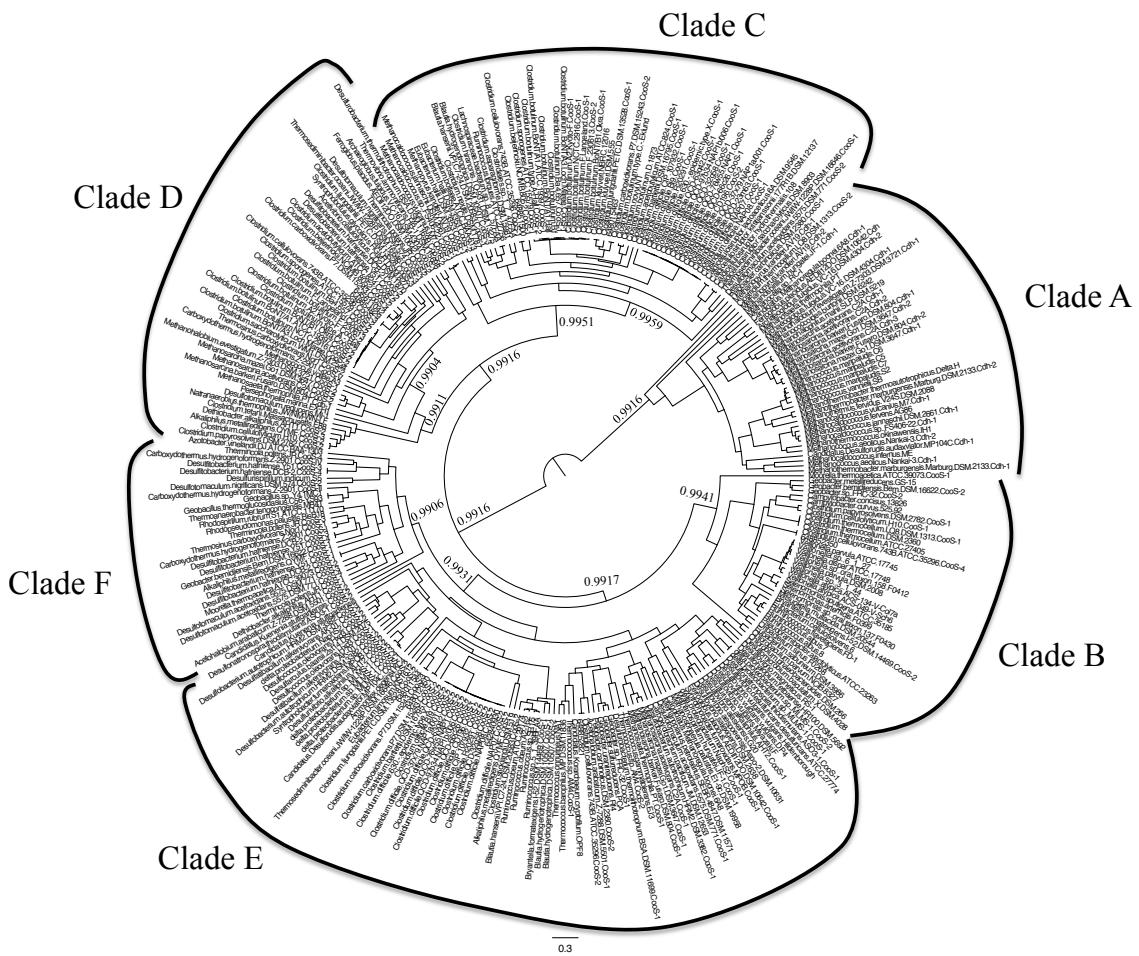
648782903	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella atypica ACS-049-V-Sch6
648785717	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella atypica ACS-134-V-Col7a
644361532	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella dispar ATCC 17748
647365898	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella parvula ATCC 17745
646431468	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella parvula DSM 2008
647987318	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella sp. 3_1_44
647989370	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella sp. 6_1_27
650267180	carbon-monoxide dehydrogenase, catalytic subunit	Veillonella sp. oral taxon 158 F0412
642557607		Candidatus Kuenenia stuttgartiensis CooS-2
650576764		Ruminococcus sp. SR1/5
646333095		Clostridium difficile CD196 CooS-1
646332633		Clostridium difficile CD196 CooS-2
644180850		Clostridium asparagiforme DSM 15981
640851017		Clostridium botulinum BoNT/A1 Hall
640572946		Clostridium botulinum type A - Hall CooS-2
650469234		Clostridium thermocellum LQ8, DSM 1313 CooS-1
648151854		Clostridium thermocellum LQ8, DSM 1313 CooS-2
646966799		Clostridium botulinum F 230613 CooS-2
641008625		Ruminococcus torques ATCC 27756

S2: Genomes encoding multiple [Ni,Fe]-CODH homologs

Genome	Number of [Ni,Fe]-CODH genes
<i>Acetohalobium arabaticum Z-7288, DSM 5501</i>	2
<i>Blautia hansenii VPI C7-24, DSM 20583</i>	2
<i>Bryantella formatexigens I-52, DSM 14469</i>	2
<i>Candidatus Desulforudis audaxviator MP104C</i>	2
<i>Candidatus Kuenenia stuttgartiensis</i>	2
<i>Candidatus Methanoregula boonei 6A8</i>	2
<i>Clostridium acetobutylicum ATCC 824</i>	2
<i>Clostridium bartletti DSM 16795</i>	2
<i>Clostridium beijerinckii NCIMB 8052</i>	2
<i>Clostridium botulinum A2 Kyoto-F</i>	2
<i>Clostridium botulinum Ba4 657</i>	2
<i>Clostridium botulinum BoNT/A1, ATCC 19397</i>	2
<i>Clostridium botulinum BoNT/A3 Loch Maree</i>	2
<i>Clostridium botulinum BoNT/B1 Okra</i>	2
<i>Clostridium botulinum F Langeland</i>	2
<i>Clostridium botulinum NCTC 2916</i>	2
<i>Clostridium cellulolyticum H10</i>	2
<i>Clostridium difficile 630 (epidemic type X)</i>	2
<i>Clostridium difficile BI9</i>	2
<i>Clostridium difficile CIP 107932</i>	2
<i>Clostridium difficile NAP07</i>	2
<i>Clostridium difficile NAP08</i>	2
<i>Clostridium difficile QCD-23m63</i>	2
<i>Clostridium difficile QCD-32g58</i>	2
<i>Clostridium difficile QCD-37x79, NAP1a/001</i>	2
<i>Clostridium difficile QCD-63q42</i>	2
<i>Clostridium difficile QCD-66c26</i>	2
<i>Clostridium difficile QCD-76w55, NAP1</i>	2
<i>Clostridium difficile QCD-97b34, NAP1b/006</i>	2
<i>Clostridium difficile R20291</i>	2
<i>Clostridium papyrosolvens DSM 2782</i>	2
<i>Clostridium sporogenes ATCC 15579</i>	2
<i>delta proteobacterium NaphS2</i>	2
<i>Desulfatibacillum alkenivorans AK-01</i>	2
<i>Desulfococcus oleovorans Hxd3</i>	2

<i>Desulfonatronospira thiodismutans ASO3-1</i>	2
<i>Desulfotomaculum nigrificans DSM 574</i>	2
<i>Desulfurivibrio alkaliphilus AHT2</i>	2
<i>Desulfurobacterium thermolithotrophum BSA, DSM 11699</i>	2
<i>Dethiobacter alkaliphilus AHT1</i>	2
<i>Eubacterium hallii DSM 3353</i>	2
<i>Geobacter bemiensis Bem, DSM 16622</i>	2
<i>Geobacter sp. FRC-32</i>	2
<i>Methanocaldococcus jannaschii DSM 2661</i>	2
<i>Methanocaldococcus sp. FS406-22</i>	2
<i>Methanocaldococcus vulcanius M7</i>	2
<i>Methanococcus aeolicus Nankai-3</i>	2
<i>Methanohalobium evestigatum Z-7303, DSM 3721</i>	2
<i>Methanospirillum hungatei JF-1</i>	2
<i>Moorella thermoacetica ATCC 39073</i>	2
<i>Pelobacter carbinolicus DSM 2380</i>	2
<i>Syntrophobacter fumaroxidans MPOB</i>	2
<i>Thermococcus sp. AM4</i>	2
<i>Thermosinus carboxydivorans Nor1</i>	2
<i>Veillonella atypica ACS-049-V-Sch6</i>	2
<i>Alkaliphilus metallireducens QYMF</i>	3
<i>Archaeoglobus fulgidus VC-16, DSM 4304</i>	3
<i>Blautia hydrogenotrophica DSM 10507</i>	3
<i>Clostridium ljungdahlii PETC, DSM 13528</i>	3
<i>Desulfovobacterium autotrophicum HRM2, DSM 3382</i>	3
<i>Ferroglobus placidus AEDII12DO, DSM 10642</i>	3
<i>Methanopyrus kandleri AV19</i>	3
<i>Methanosaeta thermophila PT</i>	3
<i>Thermosediminibacter oceani JW/IW-1228P, DSM 16646</i>	3
<i>Desulfitobacterium hafniense DCB-2</i>	4
<i>Desulfitobacterium hafniense Y51</i>	4
<i>Desulfotomaculum acetoxidans 5575, DSM 771</i>	4
<i>Methanosarcina barkeri Fusaro, DSM 804</i>	4
<i>Methanosarcina mazei Go1, DSM 3647</i>	4
<i>Thermincola potens JR</i>	4
<i>Clostridium carboxydivorans P7, DSM 15243</i>	4
<i>Clostridium cellulovorans 743B, ATCC 35296</i>	4
<i>Carboxydotothermus hydrogenoformans Z-2901</i>	5
<i>delta proteobacterium sp. MLMS-1</i>	5
<i>Methanosarcina acetivorans C2A</i>	5

S3: Circular Bayesian Inference tree with sequence names shown (Same tree as figure 1B). Posterior probabilities for deeply branching nodes are displayed.



S4: Composition of the six [Ni,Fe]-CODH clades of both the ML and BI phylogenetic trees.

Clade A	Maximum Likelihood	Bayesian Inference
	Methanopyrus kandleri AV19 Cdh-1 (638168741)	Methanopyrus kandleri AV19 Cdh-1 (638168741)
	Methanopyrus kandleri AV19 Cdh-2 (638168739)	Methanopyrus kandleri AV19 Cdh-2 (638168739)
	Methanococcus aeolicus Nankai-3 Cdh-2 (640788579)	Methanococcus aeolicus Nankai-3 Cdh-2 (640788579)
	Methanothermococcus okinawensis IH1 (648711351)	Methanothermococcus okinawensis IH1 (648711351)
	Methanocaldococcus sp. FS406-22 Cdh-1 (646622637)	Methanocaldococcus sp. FS406-22 Cdh-1 (646622637)
	Methanocaldococcus jannaschii DSM 2661 Cdh-1 (638201440)	Methanocaldococcus jannaschii DSM 2661 Cdh-1 (638201440)
	Methanocaldococcus fervens AG86 (644969638)	Methanocaldococcus fervens AG86 (644969638)
	Methanocaldococcus vulcanius M7 Cdh-1 (646367701)	Methanocaldococcus vulcanius M7 Cdh-1 (646367701)
	Methanothermus fervidus V24S DSM 2088 (649738126)	Methanothermus fervidus V24S DSM 2088 (649738126)
	Methanothermobacter thermoautotrophicus Delta H (638156260)	Methanothermobacter thermoautotrophicus Delta H (638156260)
	Methanothermobacter marburgensis Marburg DSM 2133 Cdh-2 (648150717)	Methanothermobacter marburgensis Marburg DSM 2133 Cdh-2 (648150717)
	Methanococcus vannielii SB (640785975)	Methanococcus vannielii SB (640785975)
	Methanococcus maripaludis S2 (638196180)	Methanococcus maripaludis S2 (638196180)
	Methanococcus maripaludis C6 (641284174)	Methanococcus maripaludis C6 (641284174)
	Methanococcus maripaludis C5 (640166306)	Methanococcus maripaludis C5 (640166306)
	Methanococcus maripaludis C7 (Methanococcus maripaludis C7 (
	Methanocaldococcus infernus ME (646777846)	Methanocaldococcus infernus ME (646777846)
	Methanothermobacter marburgensis Marburg DSM 2133 Cdh-1 (648151853)	Methanothermobacter marburgensis Marburg DSM 2133 Cdh-1 (648151853)
	Methanococcus aeolicus Nankai-3 Cdh-1 (640787866)	Methanococcus aeolicus Nankai-3 Cdh-1 (640787866)
	Candidatus Desulforudis audaxviator MP104C Cdh-1 (641592958)	Candidatus Desulforudis audaxviator MP104C Cdh-1 (641592958)
	Methanospirillum hungatei JF-1 Cdh-1 (637896327)	Methanospirillum hungatei JF-1 Cdh-1 (637896327)
	Methanocella sp. RC-I (640537142)	Methanocella sp. RC-I (640537142)
	Candidatus Methanoregula boonei 6A8 Cdh-1 (640868110)	Candidatus Methanoregula boonei 6A8 Cdh-1 (640868110)
	Archaeoglobus fulgidus VC-16 DSM 4304 Cdh-1 (638158998)	Archaeoglobus fulgidus VC-16 DSM 4304 Cdh-1 (638158998)
	Methanosaeta thermophila PT (639699298)	Methanosaeta thermophila PT (639699298)
	Ferroglobus placidus AEDII12DO DSM 10642 Cdh (646611862)	Ferroglobus placidus AEDII12DO DSM 10642 Cdh (646611862)
	Archaeoglobus fulgidus VC-16 DSM 4304 Cdh-2 (638157644)	Archaeoglobus fulgidus VC-16 DSM 4304 Cdh-2 (638157644)
	Methanococcoides burtonii DSM 6242 (637958643)	Methanococcoides burtonii DSM 6242 (637958643)
	Methanohalobium evestigatum Z-7303 DSM 3721 Cdh-1 (648055108)	Methanohalobium evestigatum Z-7303 DSM 3721 Cdh-1 (648055108)
	Methanohalophilus mahii SLP DSM 5219 (646707218)	Methanohalophilus mahii SLP DSM 5219 (646707218)
	Methanosarcina acetivorans C2A Cdh-2 (638179299)	Methanosarcina acetivorans C2A Cdh-2 (638179299)
	Methanosarcina acetivorans C2A Cdh-1 (638178729)	Methanosarcina acetivorans C2A Cdh-1 (638178729)
	Methanosarcina barkeri Fusaro DSM 804 Cdh-2 (637699328)	Methanosarcina barkeri Fusaro DSM 804 Cdh-2 (637699328)
	Methanosarcina mazei Go1 DSM 3647 Cdh-1 (638166633)	Methanosarcina mazei Go1 DSM 3647 Cdh-1 (638166633)
	Methanosarcina barkeri Fusaro DSM 804 Cdh-1 (637699095)	Methanosarcina barkeri Fusaro DSM 804 Cdh-1 (637699095)
	Methanosarcina acetivorans C2A Cdh-3 (638175771)	Methanosarcina acetivorans C2A Cdh-3 (638175771)
	Methanosarcina mazei Go1 DSM 3647 Cdh-2 (638165176)	Methanosarcina mazei Go1 DSM 3647 Cdh-2 (638165176)

Clade B	Moorella thermoacetica ATCC 39073 CooS-1 (637829903)	Moorella thermoacetica ATCC 39073 CooS-1 (637829903)
	Chlorobium phaeobacteroides DSM 266 (639764751)	Chlorobium phaeobacteroides DSM 266 (639764751)
	Chlorobaculum parvum NCIB 8327 (642719837)	Chlorobaculum parvum NCIB 8327 (642719837)
	Geobacter metallireducens GS-15 (637779194)	Geobacter metallireducens GS-15 (637779194)
	Geobacter sp. FRC-32 CooS-2 (643637653)	Geobacter sp. FRC-32 CooS-2 (643637653)
	Geobacter bimidiensis Bem DSM 16622 CooS-2 (642767728)	Geobacter bimidiensis Bem DSM 16622 CooS-2 (642767728)
	Campylobacter concisus 13826 (640930194)	Campylobacter concisus 13826 (640930194)
	Campylobacter curvus 525.92 (640871500)	Campylobacter curvus 525.92 (640871500)
	Clostridium papyrosolvens DSM 2782 CooS-1 (645657429)	Clostridium papyrosolvens DSM 2782 CooS-1 (645657429)
	Clostridium cellulolyticum H10 CooS-1 (643607368)	Clostridium cellulolyticum H10 CooS-1 (643607368)
	Clostridium thermocellum LQ8, DSM 1313 CooS-2 (650469234)	Clostridium thermocellum DSM 2360 (645641338)
	Clostridium thermocellum DSM 2360 (645641338)	Clostridium thermocellum ATCC 27405 (640108221)
	Clostridium thermocellum ATCC 27405 (640108221)	Clostridium cellulovorans 743B ATCC 35296 CooS-4 (648143498)
	Clostridium cellulovorans 743B ATCC 35296 CooS-4 (648143498)	Eubacterium saburreum DSM 3986 (650306428)
	Eubacterium saburreum DSM 3986 (650306428)	Oribacterium sinus F0268 (644432901)
	Oribacterium sinus F0268 (644432901)	Bryantella formataxigens I-52 DSM 14469 CooS-2 (644186543)
	Bryantella formataxigens I-52 DSM 14469 CooS-2 (644186543)	Pseudoramibacter alactolyticus ATCC 23263 (650318436)
	Pseudoramibacter alactolyticus ATCC 23263 (650318436)	Eubacterium cellulosolvens 6 (650278314)
	Eubacterium cellulosolvens 6 (650278314)	Ruminococcus albus 8 (647432713)
	Ruminococcus albus 8 (647432713)	Ruminococcus albus 7 (649820639)
	Ruminococcus albus 7 (649820639)	Ruminococcus flavefaciens FD-1 (646117268)
	Ruminococcus flavefaciens FD-1 (646117268)	Mitsuokella multacida DSM 20544 (643105987)
	Mitsuokella multacida DSM 20544 (643105987)	Selenomonas sputigena ATCC 35185 (646081752)
	Selenomonas sputigena ATCC 35185 (646081752)	Selenomonas sp. oral taxon 137 F0430 (650270183)
	Selenomonas sp. oral taxon 137 F0430 (650270183)	Selenomonas artemidis F0399 (650191662)
	Selenomonas artemidis F0399 (650191662)	Veillonella sp. oral taxon 158 F0412 (650267180)
	Veillonella sp. oral taxon 158 F0412 (650267180)	Veillonella dispar ATCC 17748 (644361532)
	Veillonella dispar ATCC 17748 (644361532)	Veillonella atypica ACS-049-V-Sch6 (648782903)
	Veillonella atypica ACS-049-V-Sch6 (648782903)	Veillonella atypica ACS-134-V-Col7a (648785717)
	Veillonella atypica ACS-134-V-Col7a (648785717)	Veillonella sp. 3_1_44 (647987318)
	Veillonella sp. 3_1_44 (647987318)	Veillonella parvula DSM 2008 (646431468)
	Veillonella parvula DSM 2008 (646431468)	Veillonella parvula ATCC 17745 (647365898)
	Veillonella parvula ATCC 17745 (647365898)	Veillonella sp. 6_1_27 (647989370)
	Veillonella sp. 6_1_27 (647989370)	Clostridium thermocellum LQ8, DSM 1313 CooS-1 (650469234)
Clade C	Methanopyrus kandleri AV19 CooS-1 (638168546)	Methanopyrus kandleri AV19 CooS-1 (638168546)
	Methanocaldococcus vulcanius M7 CooS-1 (646367137)	Methanocaldococcus vulcanius M7 CooS-1 (646367137)
	Methanocaldococcus sp. FS406-22 CooS-1 (646623958)	Methanocaldococcus sp. FS406-22 CooS-1 (646623958)
	Methanocaldococcus jannaschii DSM 2661 CooS-1 (638202064)	Methanocaldococcus jannaschii DSM 2661 CooS-1 (638202064)
	Pelobacter carbinolicus DSM 2380 CooS-1 (637750481)	Pelobacter carbinolicus DSM 2380 CooS-1 (637750481)
	Clostridium bartlettii DSM 16795 CooS-1 (642161933)	Clostridium bartlettii DSM 16795 CooS-1 (642161933)

	Clostridium difficile QCD-23m63 CooS-1 (642841936)	Clostridium difficile QCD-23m63 CooS-1 (642841936)
	Clostridium difficile NAP07 CooS-1 (647531510)	Clostridium difficile NAP07 CooS-1 (647531510)
	Clostridium difficile NAP08 CooS-1 (647511425)	Clostridium difficile NAP08 CooS-1 (647511425)
	Clostridium difficile QCD-32g58 CooS-1 (638869554)	Clostridium difficile QCD-32g58 CooS-1 (638869554)
	Clostridium difficile CIP 107932 CooS-1 (642840002)	Clostridium difficile CIP 107932 CooS-1 (642840002)
	Clostridium difficile QCD-76w55 NAP1 CooS-1 (642236500)	Clostridium difficile QCD-76w55 NAP1 CooS-1 (642236500)
	Clostridium difficile QCD-97b34 NAP1b/006 CooS-1 (642238403)	Clostridium difficile QCD-97b34 NAP1b/006 CooS-1 (642238403)
	Clostridium difficile QCD-37x79 NAP1a/001 CooS-1 (642243859)	Clostridium difficile QCD-37x79 NAP1a/001 CooS-1 (642243859)
	Clostridium difficile QCD-66c26 CooS-1 (645110909)	Clostridium difficile QCD-66c26 CooS-1 (645110909)
	Clostridium difficile CD196 CooS-2 (646332633)	Clostridium difficile CD196 CooS-2 (646332633)
	Clostridium difficile 630 - epidemic type X CooS-1 (640155919)	Clostridium difficile 630 - epidemic type X CooS-1 (640155919)
	Clostridium difficile BI9 CooS-1 (647016785)	Clostridium difficile BI9 CooS-1 (647016785)
	Clostridium difficile R20291 CooS-1 (646336115)	Clostridium difficile R20291 CooS-1 (646336115)
	Clostridium difficile QCD-63q42 CooS-1 (642229198)	Clostridium difficile QCD-63q42 CooS-1 (642229198)
	Caldicellulosiruptor kristjanssonii 177R1B DSM 12137 (649757735)	Caldicellulosiruptor kristjanssonii 177R1B DSM 12137 (649757735)
	Caldicellulosiruptor lactoaceticus 6A DSM 9545 (650233746)	Caldicellulosiruptor lactoaceticus 6A DSM 9545 (650233746)
	Caldicellulosiruptor saccharolyticus DSM 8903 (640494759)	Caldicellulosiruptor saccharolyticus DSM 8903 (640494759)
	Caldicellulosiruptor hydrothermalis 108 (649725251)	Caldicellulosiruptor hydrothermalis 108 (649725251)
	Clostridium bolteae ATCC BAA-613 (641407361)	Clostridium bolteae ATCC BAA-613 (641407361)
	Eubacterium hallii DSM 3353 CooS-1 (644225640)	Eubacterium hallii DSM 3353 CooS-1 (644225640)
	Eubacterium hallii DSM 3353 CooS-2 (644228698)	Eubacterium hallii DSM 3353 CooS-2 (644228698)
	Clostridium asparagiforme DSM 15981 (644180850)	Clostridium asparagiforme DSM 15981 (644180850)
	Clostridiales sp. 1 7 47FAA (643914470)	Clostridiales sp. 1 7 47FAA (643914470)
	Clostridium hiranonis TO-931 DSM 13275 (643117552)	Clostridium hiranonis TO-931 DSM 13275 (643117552)
	Ruminococcus torques ATCC 27756 (641008625)	Ruminococcus torques ATCC 27756 (641008625)
	Lachnospiraceae bacterium sp. 8 1 57FAA (650049856)	Lachnospiraceae bacterium sp. 8 1 57FAA (650049856)
	Clostridium nexile DSM 1787 (643115070)	Clostridium nexile DSM 1787 (643115070)
	Blautia hansenii VPI C7-24 DSM 20583 CooS-1 (644139022)	Blautia hansenii VPI C7-24 DSM 20583 CooS-1 (644139022)
	Blautia hydrogenotrophica DSM 10507 CooS-3 (644156739)	Blautia hydrogenotrophica DSM 10507 CooS-3 (644156739)
	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-2 (645035189)	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-2 (645035189)
	Thermosediminibacter oceanii JW/IW-1228P DSM 16646 CooS-1 (648126397)	Thermosediminibacter oceanii JW/IW-1228P DSM 16646 CooS-1 (648126397)
	Clostridium beijerinckii NCIMB 8052 CooS-1 (640775295)	Clostridium beijerinckii NCIMB 8052 CooS-1 (640775295)
	Clostridium cellulovorans 743B ATCC 35296 CooS-1 (648147312)	Clostridium cellulovorans 743B ATCC 35296 CooS-1 (648147312)
	Clostridium botulinum D 1873 (645587100)	Clostridium botulinum D 1873 (645587100)
	Clostridium botulinum type C - Eklund (642089439)	Clostridium botulinum type C - Eklund (642089439)
	Clostridium novyi NT (639733200)	Clostridium novyi NT (639733200)
	Clostridium acetobutylicum ATCC 824 CooS-1 (637175758)	Clostridium acetobutylicum ATCC 824 CooS-1 (637175758)
	Clostridium carboxidivorans P7 DSM 15243 CooS-2 (645612461)	Clostridium carboxidivorans P7 DSM 15243 CooS-2 (645612461)
	Clostridium ljungdahlii PETC DSM 13528 CooS-1 (648088651)	Clostridium ljungdahlii PETC DSM 13528 CooS-1 (648088651)
	Clostridium kluyveri DSM 555 (640859387)	Clostridium kluyveri DSM 555 (640859387)
	Clostridium kluyveri NBRC 12016 (643576133)	Clostridium kluyveri NBRC 12016 (643576133)

	Clostridium sporogenes ATCC 15579 CooS-1 (642851225)	Clostridium sporogenes ATCC 15579 CooS-1 (642851225)
	Clostridium botulinum A2 Kyoto-F CooS-1 (643809489)	Clostridium botulinum A2 Kyoto-F CooS-1 (643809489)
	Clostridium botulinum BoNT/B1 Okra CooS-1 (641654483)	Clostridium botulinum BoNT/B1 Okra CooS-1 (641654483)
	Clostridium botulinum NCTC 2916 CooS-1 (642083741)	Clostridium botulinum NCTC 2916 CooS-1 (642083741)
	Clostridium botulinum F 230613 CooS-2 (646966799)	Clostridium botulinum F 230613 CooS-2 (646966799)
	Clostridium botulinum F Langeland CooS-1 (640854619)	Clostridium botulinum F Langeland CooS-1 (640854619)
	Clostridium botulinum BoNT/A3 Loch Maree CooS-1 (641660414)	Clostridium botulinum BoNT/A3 Loch Maree CooS-1 (641660414)
	Clostridium botulinum Bf (642087855)	Clostridium botulinum Bf (642087855)
	Clostridium botulinum Ba4 657 CooS-1 (643846512)	Clostridium botulinum Ba4 657 CooS-1 (643846512)
	Clostridium botulinum BoNT/A1 ATCC 19397 CooS-1 (640847354)	Clostridium botulinum BoNT/A1 ATCC 19397 CooS-1 (640847354)
	Clostridium botulinum BoNT/A1 Hall (640851017)	Clostridium botulinum BoNT/A1 Hall (640851017)
	Clostridium botulinum type A - Hall CooS-2 (640572946)	Clostridium botulinum type A - Hall CooS-2 (640572946)
Clade D	Desulfotomaculum reducens MI-1 (640179826)	Desulfotomaculum reducens MI-1 (640179826)
	Natranaerobius thermophilus JW/NM-WN-LF (642643233)	Natranaerobius thermophilus JW/NM-WN-LF (642643233)
	Dethiobacter alkaliphilus AHT1 CooS-2 (644400183)	Dethiobacter alkaliphilus AHT1 CooS-2 (644400183)
	Alkaliphilus metallireducens QYMF CooS-3 (640782069)	Alkaliphilus metallireducens QYMF CooS-3 (640782069)
	Clostridium tetani Massachusetts E88 (637385980)	Clostridium tetani Massachusetts E88 (637385980)
	Clostridium cellulolyticum H10 CooS-2 (643609818)	Clostridium cellulolyticum H10 CooS-2 (643609818)
	Clostridium papyrosolvens DSM 2782 CooS-2 (645655030)	Clostridium papyrosolvens DSM 2782 CooS-2 (645655030)
	Persephonella marina EX-H1 (643742627)	Persephonella marina EX-H1 (643742627)
	Archaeoglobus fulgidus VC-16 DSM 4304 CooS-1 (638158420)	Archaeoglobus fulgidus VC-16 DSM 4304 CooS-1 (638158420)
	Ferroglobus placidus AEDII12DO DSM 10642 CooS-2 (646613484)	Ferroglobus placidus AEDII12DO DSM 10642 CooS-2 (646613484)
	Methanohalobium evestigatum Z-7303 DSM 3721 CooS-1 (648941024)	Methanohalobium evestigatum Z-7303 DSM 3721 CooS-1 (648941024)
	Methanosaeta thermophila PT Cdh-1 (639700232)	Methanosaeta thermophila PT Cdh-1 (639700232)
	Methanosarcina mazei Go1 DSM 3647 CooS-2 (638166856)	Methanosarcina mazei Go1 DSM 3647 CooS-2 (638166856)
	Methanosarcina barkeri Fusaro DSM 804 CooS-2 (637702550)	Methanosarcina barkeri Fusaro DSM 804 CooS-2 (637702550)
	Methanosarcina acetivorans C2A CooS-2 (638176076)	Methanosarcina acetivorans C2A CooS-2 (638176076)
	Desulfurobacterium thermolithotrophum BSA DSM 11699 CooS-2 (649989056)	Desulfurobacterium thermolithotrophum BSA DSM 11699 CooS-2 (649989056)
	Thermovibrio ammonificans HB-1 DSM 15698 (649882823)	Thermovibrio ammonificans HB-1 DSM 15698 (649882823)
	Methanococcus voltae A3 (646858615)	Methanococcus voltae A3 (646858615)
	Carboxydothermus hydrogenoformans Z-2901 CooS-V (637752792)	Carboxydothermus hydrogenoformans Z-2901 CooS-V (637752792)
	Thermincola potens JR CooS-2 (646798743)	Thermincola potens JR CooS-2 (646798743)
	Desulfotomaculum nigrificans DSM 574 CooS-1 (650356635)	Desulfotomaculum nigrificans DSM 574 CooS-1 (650356635)
	Thermosinus carboxydivorans Nor1 CooS-2 (640208322)	Thermosinus carboxydivorans Nor1 CooS-2 (640208322)
	Thermosediminibacter oceanii JW/IW-1228P DSM 16646 CooS-3 (648126808)	Thermosediminibacter oceanii JW/IW-1228P DSM 16646 CooS-3 (648126808)
	Syntrophobolbus glycolicus FlGlyR DSM 8271 (649975550)	Syntrophobolbus glycolicus FlGlyR DSM 8271 (649975550)
	Clostridium ljungdahlii PETC DSM 13528 CooS-3 (648089530)	Clostridium ljungdahlii PETC DSM 13528 CooS-3 (648089530)
	Clostridium saccharolyticum WM1 DSM 2544 (648122771)	Clostridium saccharolyticum WM1 DSM 2544 (648122771)
	Acetivibrio cellulolyticus CD2 DSM 1870 (648713299)	Acetivibrio cellulolyticus CD2 DSM 1870 (648713299)
	Desulfitobacterium hafniense DCB-2 CooS-2 (643561081)	Desulfitobacterium hafniense DCB-2 CooS-2 (643561081)

	Desulfitobacterium hafniense Y51 CooS-2 (637913947)	Desulfitobacterium hafniense Y51 CooS-2 (637913947)
	Clostridium beijerinckii NCIMB 8052 CooS-2 (640773260)	Clostridium beijerinckii NCIMB 8052 CooS-2 (640773260)
	Clostridium carboxidivorans P7 DSM 15243 CooS-4 (648015111)	Clostridium carboxidivorans P7 DSM 15243 CooS-4 (648015111)
	Clostridium acetobutylicum ATCC 824 CooS-2 (637178154)	Clostridium acetobutylicum ATCC 824 CooS-2 (637178154)
	Clostridium cellulovorans 743B ATCC 35296 CooS-3 (648144639)	Clostridium cellulovorans 743B ATCC 35296 CooS-3 (648144639)
	Clostridium sporogenes ATCC 15579 CooS-2 (642850320)	Clostridium sporogenes ATCC 15579 CooS-2 (642850320)
	Clostridium botulinum Ba4 657 CooS-2 (643847471)	Clostridium botulinum Ba4 657 CooS-2 (643847471)
	Clostridium botulinum BoNT/A3 Loch Maree CooS-2 (641661287)	Clostridium botulinum BoNT/A3 Loch Maree CooS-2 (641661287)
	Clostridium botulinum F 230613	Clostridium botulinum F 230613
	Clostridium botulinum F Langeland CooS-2 (640855445)	Clostridium botulinum F Langeland CooS-2 (640855445)
	Clostridium botulinum BoNT/A1 ATCC 19397 CooS-2 (640848138)	Clostridium botulinum BoNT/A1 ATCC 19397 CooS-2 (640848138)
	Clostridium botulinum type A - Hall CooS-1 (640573808)	Clostridium botulinum type A - Hall CooS-1 (640573808)
	Clostridium botulinum NCTC 2916 CooS-2 (642083651)	Clostridium botulinum NCTC 2916 CooS-2 (642083651)
	Clostridium botulinum BoNT/B1 Okra CooS-2 (641655347)	Clostridium botulinum BoNT/B1 Okra CooS-2 (641655347)
	Clostridium botulinum A2 Kyoto-F CooS-2 (643810364)	Clostridium botulinum A2 Kyoto-F CooS-2 (643810364)
Clade E	Desulfurobacterium thermolithotrophum BSA DSM 11699 CooS-1 (649988639)	Desulfurobacterium thermolithotrophum BSA DSM 11699 CooS-1 (649988639)
	Thermococcus gammatolerans EJ3 (644808120)	Thermococcus gammatolerans EJ3 (644808120)
	Thermococcus sp. AM4 CooS-2 (647639008)	Thermococcus sp. AM4 CooS-2 (647639008)
	Pelobacter carbinolicus DSM 2380 CooS-2 (637749636)	Pelobacter carbinolicus DSM 2380 CooS-2 (637749636)
	Geobacter uraniireducens Rf4 (640548118)	Geobacter uraniireducens Rf4 (640548118)
	Geobacter sp. FRC-32 CooS-1 (643638334)	Geobacter sp. FRC-32 CooS-1 (643638334)
	Geobacter Sulfurreducens PCA (6437126789)	Geobacter Sulfurreducens PCA (6437126789)
	Acetohalobium arabaticum Z-7288 DSM 5501 CooS-1	Acetohalobium arabaticum Z-7288 DSM 5501 CooS-1
	Clostridium cellulovorans 743B ATCC 35296 CooS-2 (648145679).	Clostridium cellulovorans 743B ATCC 35296 CooS-2 (648145679).
	Candidatus Korarchaeum cryptofilum OPF8 (641613835)	Candidatus Korarchaeum cryptofilum OPF8 (641613835)
	Thermococcus barophilus MP DSM 11836 (649801968)	Thermococcus barophilus MP DSM 11836 (649801968)
	Carboxydibrachium pacificum JM DSM 12653 (647641896)	Carboxydibrachium pacificum JM DSM 12653 (647641896)
	Thermococcus sp. AM4 CooS-1 (647640771)	Thermococcus sp. AM4 CooS-1 (647640771)
	Thermococcus onnurineus NA1 (643421560)	Thermococcus onnurineus NA1 (643421560)
	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-1 (645034634)	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-1 (645034634)
	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-1 (643723073)	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-1 (643723073)
	Methanosaeta thermophila PT CooS-1 (639700357)	Methanosaeta thermophila PT CooS-1 (639700357)
	Methanoscincus barkeri Fusaro DSM 804 CooS-1 (637702351)	Methanoscincus barkeri Fusaro DSM 804 CooS-1 (637702351)
	Methanoscincus mazei Go1 DSM 3647 CooS-1 (638164581)	Methanoscincus mazei Go1 DSM 3647 CooS-1 (638164581)
	Methanoscincus acetivorans C2A CooS-1 (638178125)	Methanoscincus acetivorans C2A CooS-1 (638178125)
	Methanospaerula palustris E1-9c DSM 19958 (643569491)	Methanospaerula palustris E1-9c DSM 19958 (643569491)
	Methanospirillum hungatei JF-1 CooS-1 (637896912)	Methanospirillum hungatei JF-1 CooS-1 (637896912)
	Candidatus Methanoregula boonei 6A8 Cd-1 (640868606)	Candidatus Methanoregula boonei 6A8 Cd-1 (640868606)
	Methanoplanus petrolearius SEBR 4847 DSM 11571 (648193898)	Methanoplanus petrolearius SEBR 4847 DSM 11571 (648193898)
	Ferroglobus placidus AEDII12DO DSM 10642 CooS-1 (646613669)	Ferroglobus placidus AEDII12DO DSM 10642 CooS-1 (646613669)

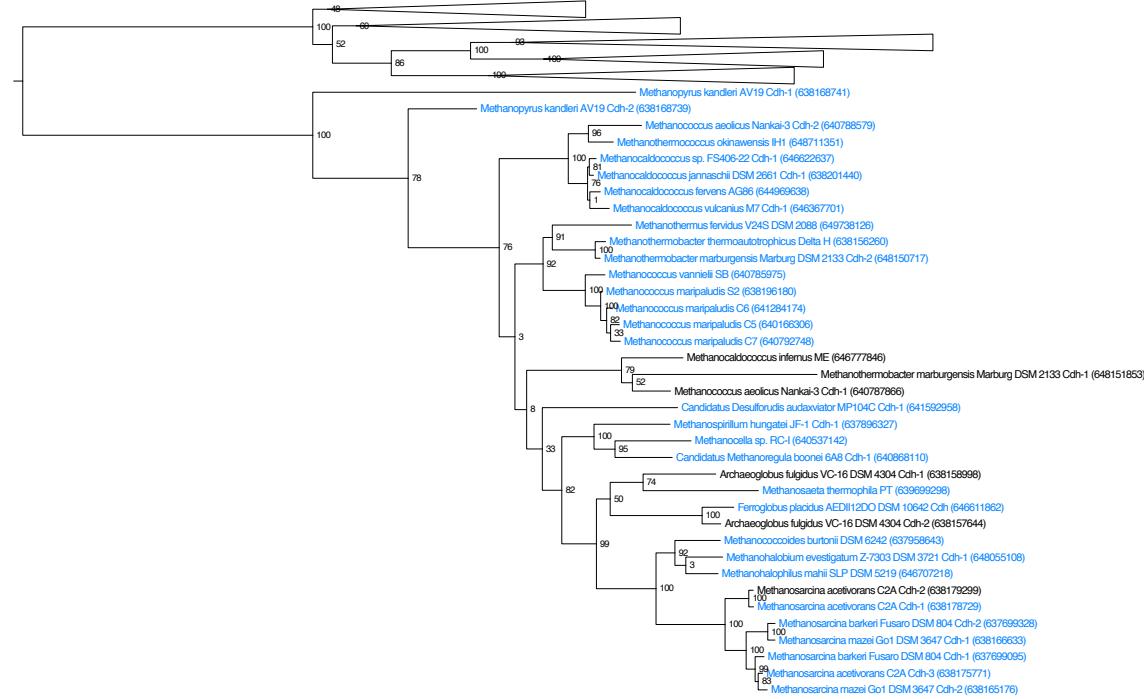
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	Syntrophobacter fumaroxidans MPOB CooS-1 (639703649)	Syntrophobacter fumaroxidans MPOB CooS-1 (639703649)
	Desulfohalobium retbaense HR100 DSM 5692 (645037809)	Desulfohalobium retbaense HR100 DSM 5692 (645037809)
	Desulfomicrobium baculatum X DSM 4028 (645000173)	Desulfomicrobium baculatum X DSM 4028 (645000173)
	Desulfovibrio magneticus RS-1 (644802844)	Desulfovibrio magneticus RS-1 (644802844)
	Desulfonatronospira thiodismutans ASO3-1 CooS-1 (644404981)	Desulfonatronospira thiodismutans ASO3-1 CooS-1 (644404981)
	delta proteobacterium sp. MLMS-1 CooS-1 (639154103)	delta proteobacterium sp. MLMS-1 CooS-1 (639154103)
	delta proteobacterium sp. MLMS-1 CooS-2 (639157444)	delta proteobacterium sp. MLMS-1 CooS-2 (639157444)
	Desulfurivibrio alkaliphilus AHT2 CooS-1 (646845554)	Desulfurivibrio alkaliphilus AHT2 CooS-1 (646845554)
	Desulfovibrio alaskensis G20 (637783936)	Desulfovibrio alaskensis G20 (637783936)
	Desulfovibrio salexigens DSM 2638 (644840671)	Desulfovibrio salexigens DSM 2638 (644840671)
	Desulfovibrio aespoeensis Aspo-2 DSM 10631 (649851318)	Desulfovibrio aespoeensis Aspo-2 DSM 10631 (649851318)
	Desulfovibrio desulfuricans desulfuricans ATCC 27774 (643581172)	Desulfovibrio desulfuricans desulfuricans ATCC 27774 (643581172)
	Desulfovibrio vulgaris Miyazaki F (643540759)	Desulfovibrio vulgaris Miyazaki F (643540759)
	Desulfovibrio vulgaris vulgaris DP4 (639819362)	Desulfovibrio vulgaris vulgaris DP4 (639819362)
	Desulfovibrio vulgaris vulgaris Hildenborough (637123329)	Desulfovibrio vulgaris vulgaris Hildenborough (637123329)
	Desulfonatronospira thiodismutans ASO3-1 CooS-2 (644403507)	Desulfonatronospira thiodismutans ASO3-1 CooS-2 (644403507)
	Candidatus Kuenenia stuttgartiensis CooS-1 (642557948)	Candidatus Kuenenia stuttgartiensis CooS-1 (642557948)
	Candidatus Desulforudis audaxviator MP104C CooS-1 (641593682)	Candidatus Desulforudis audaxviator MP104C CooS-1 (641593682)
	Ammonifex degensii KC4 (646358364)	Ammonifex degensii KC4 (646358364)
	Desulfurivibrio alkaliphilus AHT2 CooS-2 (646846052)	Desulfurivibrio alkaliphilus AHT2 CooS-2 (646846052)
	delta proteobacterium sp. MLMS-1 CooS-5 (639158104)	delta proteobacterium sp. MLMS-1 CooS-5 (639158104)
	delta proteobacterium sp. MLMS-1 CooS-4 (639157084)	delta proteobacterium sp. MLMS-1 CooS-4 (639157084)
	delta proteobacterium sp. MLMS-1 CooS-3 (639153979)	delta proteobacterium sp. MLMS-1 CooS-3 (639153979)
	Syntrophobacter fumaroxidans MPOB CooS-2 (639703332)	Syntrophobacter fumaroxidans MPOB CooS-2 (639703332)
	Desulfatibacillum alkenivorans AK-01 CooS-2 (643535560)	Desulfatibacillum alkenivorans AK-01 CooS-2 (643535560)
	Desulfococcus oleovorans Hxd3 CooS-1 (641264056)	Desulfococcus oleovorans Hxd3 CooS-1 (641264056)
	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-2 (643722831)	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-2 (643722831)
	Desulfarculus baarsii 2st14 DSM 2075 (648111450)	Desulfarculus baarsii 2st14 DSM 2075 (648111450)
	Desulfatibacillum alkenivorans AK-01 CooS-1 (643533854)	Desulfatibacillum alkenivorans AK-01 CooS-1 (643533854)
	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-3 (643720399)	Desulfobacterium autotrophicum HRM2 DSM 3382 CooS-3 (643720399)
	delta proteobacterium NaphS2 CooS-2 (648673357)	delta proteobacterium NaphS2 CooS-2 (648673357)
	Desulfococcus oleovorans Hxd3 CooS-2 (641265804)	Desulfococcus oleovorans Hxd3 CooS-2 (641265804)
	Thermosediminibacter oceani JW/IW-1228P DSM 16646 CooS-2 (648126845)	Thermosediminibacter oceani JW/IW-1228P DSM 16646 CooS-2 (648126845)
	Clostridium carboxidivorans P7 DSM 15243 CooS-1 (645610865)	Clostridium carboxidivorans P7 DSM 15243 CooS-1 (645610865)
	Clostridium ljungdahlii PETC DSM 13528 CooS-2 (648091499)	Clostridium ljungdahlii PETC DSM 13528 CooS-2 (648091499)
	Clostridium carboxidivorans P7 DSM 15243 CooS-3 (645613653)	Clostridium carboxidivorans P7 DSM 15243 CooS-3 (645613653)
	Eubacterium limosum KIST612 (649696910)	Eubacterium limosum KIST612 (649696910)
	Alkaliphilus metallireducens QYMF CooS-2 (640782882)	Alkaliphilus metallireducens QYMF CooS-2 (640782882)
	Clostridium sticklandii DSM 519 (649671267)	Clostridium sticklandii DSM 519 (649671267)
	Blautia hydrogenotrophica DSM 10507 CooS-2 (644157708)	Blautia hydrogenotrophica DSM 10507 CooS-2 (644157708)

	Blautia hansenii VPI C7-24 DSM 20583 CooS-2 (644139338)	Blautia hansenii VPI C7-24 DSM 20583 CooS-2 (644139338)
	Blautia hydrogenotrophica DSM 10507 CooS-1 (644154642)	Blautia hydrogenotrophica DSM 10507 CooS-1 (644154642)
	Bryantella formatexigens I-52 DSM 14469 CooS-1 (644189211)	Bryantella formatexigens I-52 DSM 14469 CooS-1 (644189211)
	Ruminococcus sp. SR1/5 (650576764)	Ruminococcus sp. SR1/5 (650576764)
	Ruminococcus obeum ATCC 29174 (641008229)	Ruminococcus obeum ATCC 29174 (641008229)
	Ruminococcus obeum A2-162 (650581529)	Ruminococcus obeum A2-162 (650581529)
	Ruminococcus sp. 5 1 39BFAA (646279410)	Ruminococcus sp. 5 1 39BFAA (646279410)
	Clostridium bartletti DSM 16795 CooS-2 (642162500)	Clostridium bartletti DSM 16795 CooS-2 (642162500)
	Clostridium difficile BI9 CooS-2 (647017332)	Clostridium difficile BI9 CooS-2 (647017332)
	Clostridium difficile QCD-66c26 CooS-2 (645111408)	Clostridium difficile QCD-66c26 CooS-2 (645111408)
	Clostridium difficile QCD-32g58 CooS-2 (638870073)	Clostridium difficile QCD-32g58 CooS-2 (638870073)
	Clostridium difficile NAP07 CooS-2 (647528689)	Clostridium difficile NAP07 CooS-2 (647528689)
	Clostridium difficile QCD-97b34 NAP1b/006 CooS-2 (642240118)	Clostridium difficile QCD-97b34 NAP1b/006 CooS-2 (642240118)
	Clostridium difficile QCD-37x79 NAP1a/001 CooS-2 (642243769)	Clostridium difficile QCD-37x79 NAP1a/001 CooS-2 (642243769)
	Clostridium difficile R20291 CooS-2 (646336578)	Clostridium difficile R20291 CooS-2 (646336578)
	Clostridium difficile CD196 CooS-1 (646333095)	Clostridium difficile CD196 CooS-1 (646333095)
	Clostridium difficile QCD-23m63 CooS-2 (642840930)	Clostridium difficile QCD-23m63 CooS-2 (642840930)
	Clostridium difficile NAP08 CooS-2 (647508431)	Clostridium difficile NAP08 CooS-2 (647508431)
	Clostridium difficile QCD-76w55 NAP1 CooS-2 (642234736)	Clostridium difficile QCD-76w55 NAP1 CooS-2 (642234736)
	Clostridium difficile 630 - epidemic type X CooS-2 (640156483)	Clostridium difficile 630 - epidemic type X CooS-2 (640156483)
	Clostridium difficile QCD-63q42 CooS-2 (642229464)	Clostridium difficile QCD-63q42 CooS-2 (642229464)
	Clostridium difficile CIP 107932 CooS-2 (642838167)	Clostridium difficile CIP 107932 CooS-2 (642838167)
Clade F	Candidatus Kuenenia stuttgartiensis CooS-2 (642557607)	Candidatus Kuenenia stuttgartiensis CooS-2 (642557607)
	Azotobacter vinelandii DJ ATCC BAA-1303 (643803370)	Azotobacter vinelandii DJ ATCC BAA-1303 (643803370)
	Desulfotomaculum nigrificans DSM 574 CooS-2 (650356975)	Desulfotomaculum nigrificans DSM 574 CooS-2 (650356975)
	Desulfurispirillum indicum S5 (649844314)	Desulfurispirillum indicum S5 (649844314)
	Thermincola potens JR CooS-4 (646798535)	Thermincola potens JR CooS-4 (646798535)
	Carboxydothermus hydrogenoformans Z-2901 CooS-IV (637753488)	Carboxydothermus hydrogenoformans Z-2901 CooS-IV (637753488)
	Desulfitobacterium hafniense DCB-2 CooS-4 (643560799)	Desulfitobacterium hafniense DCB-2 CooS-4 (643560799)
	Desulfitobacterium hafniense Y51 CooS-3 (637914218)	Desulfitobacterium hafniense Y51 CooS-3 (637914218)
	Alkaliphilus metallireducens QYMF CooS-1 (640784597)	Alkaliphilus metallireducens QYMF CooS-1 (640784597)
	Geobacter bemandrensis Bem DSM 16622 CooS-1 (642766034)	Geobacter bemandrensis Bem DSM 16622 CooS-1 (642766034)
	Rhodopseudomonas palustris BisB18 (637927609)	Rhodopseudomonas palustris BisB18 (637927609)
	Rhodospirillum rubrum S1 ATCC 11170 (637825517)	Rhodospirillum rubrum S1 ATCC 11170 (637825517)
	Carboxydothermus hydrogenoformans Z-2901 CooS-I (637754564)	Carboxydothermus hydrogenoformans Z-2901 CooS-I (637754564)
	Thermosinus carboxydivorans Nor1 CooS-1 (640207875)	Thermosinus carboxydivorans Nor1 CooS-1 (640207875)
	Thermincola potens JR CooS-3 (646799559)	Thermincola potens JR CooS-3 (646799559)
	Desulfitobacterium hafniense Y51 CooS-4 (637912396)	Desulfitobacterium hafniense Y51 CooS-4 (637912396)
	Desulfitobacterium hafniense DCB-2 CooS-3 (643563716)	Desulfitobacterium hafniense DCB-2 CooS-3 (643563716)
	Carboxydothermus hydrogenoformans Z-2901 CooS-II (637752843)	Carboxydothermus hydrogenoformans Z-2901 CooS-II (637752843)

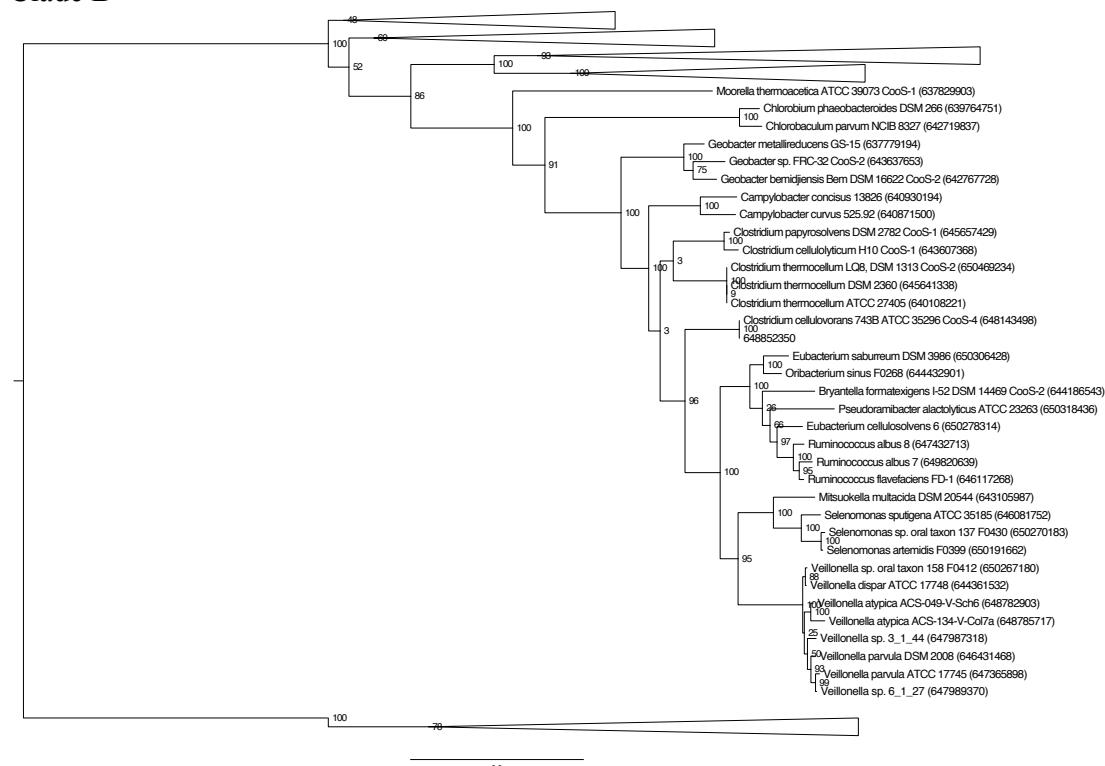
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	Geobacillus sp. Y4.1MC1 (649723023)	Geobacillus sp. Y4.1MC1 (649723023)
	Geobacillus thermoglucosidasius C56-YS93 (647479848)	Geobacillus thermoglucosidasius C56-YS93 (647479848)
	Acetohalobium arabaticum Z-7288 DSM 5501 CooS-2 (648129663)	Acetohalobium arabaticum Z-7288 DSM 5501 CooS-2 (648129663)
	Dethiobacter alkaliphilus AHT1 CooS-1 (644401105)	Dethiobacter alkaliphilus AHT1 CooS-1 (644401105)
	Desulfitobacterium hafniense DCB-2 CooS-1 (643562716)	Desulfitobacterium hafniense DCB-2 CooS-1 (643562716)
	Desulfitobacterium hafniense Y51 CooS-1 (637911405)	Desulfitobacterium hafniense Y51 CooS-1 (637911405)
	Thermincola potens JR CooS-1 (646797767)	Thermincola potens JR CooS-1 (646797767)
	Moorella thermoacetica ATCC 39073 CooS-2 (637829136)	Moorella thermoacetica ATCC 39073 CooS-2 (637829136)
	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-3 (645033610)	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-3 (645033610)
	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-4 (645036007)	Desulfotomaculum acetoxidans 5575 DSM 771 CooS-4 (645036007)

S5. Subtrees of maximum likelihood tree of [Ni,Fe]-CODHs (Figure 2) divided based on clades.

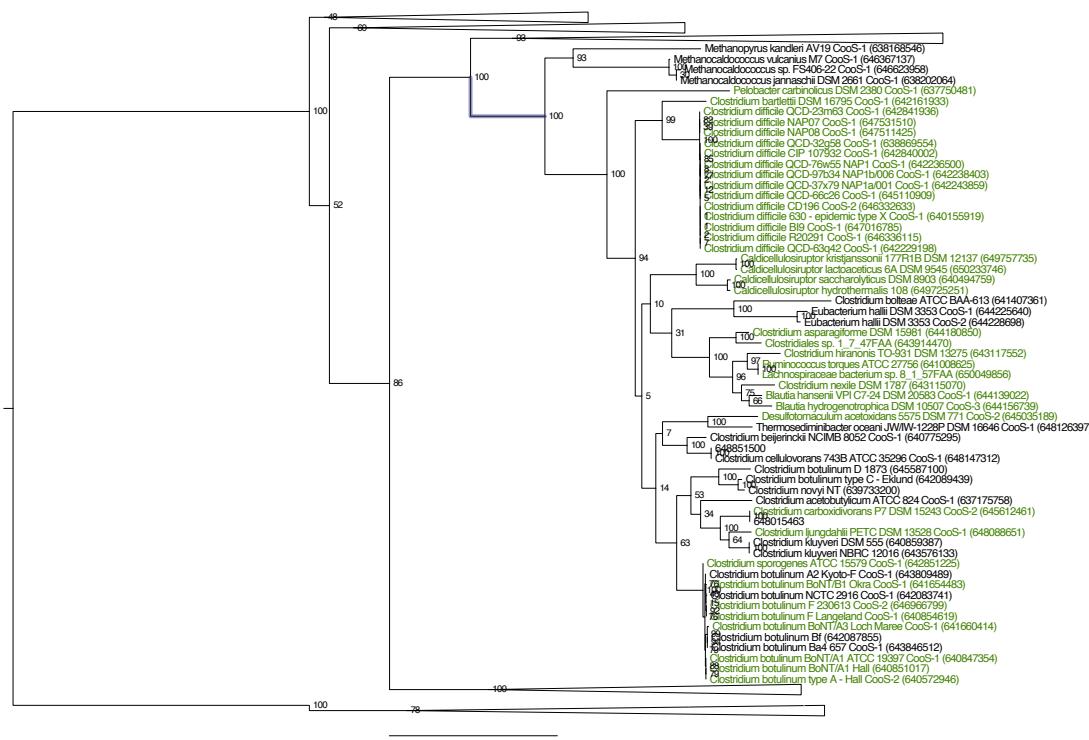
Clade A



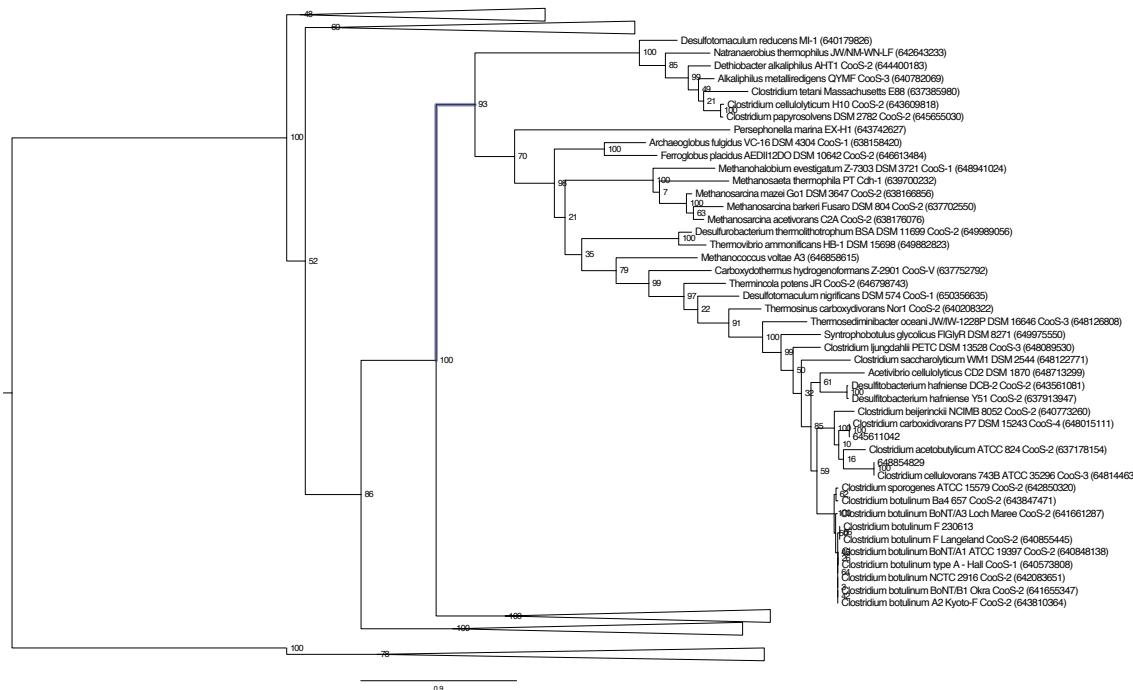
Clade B



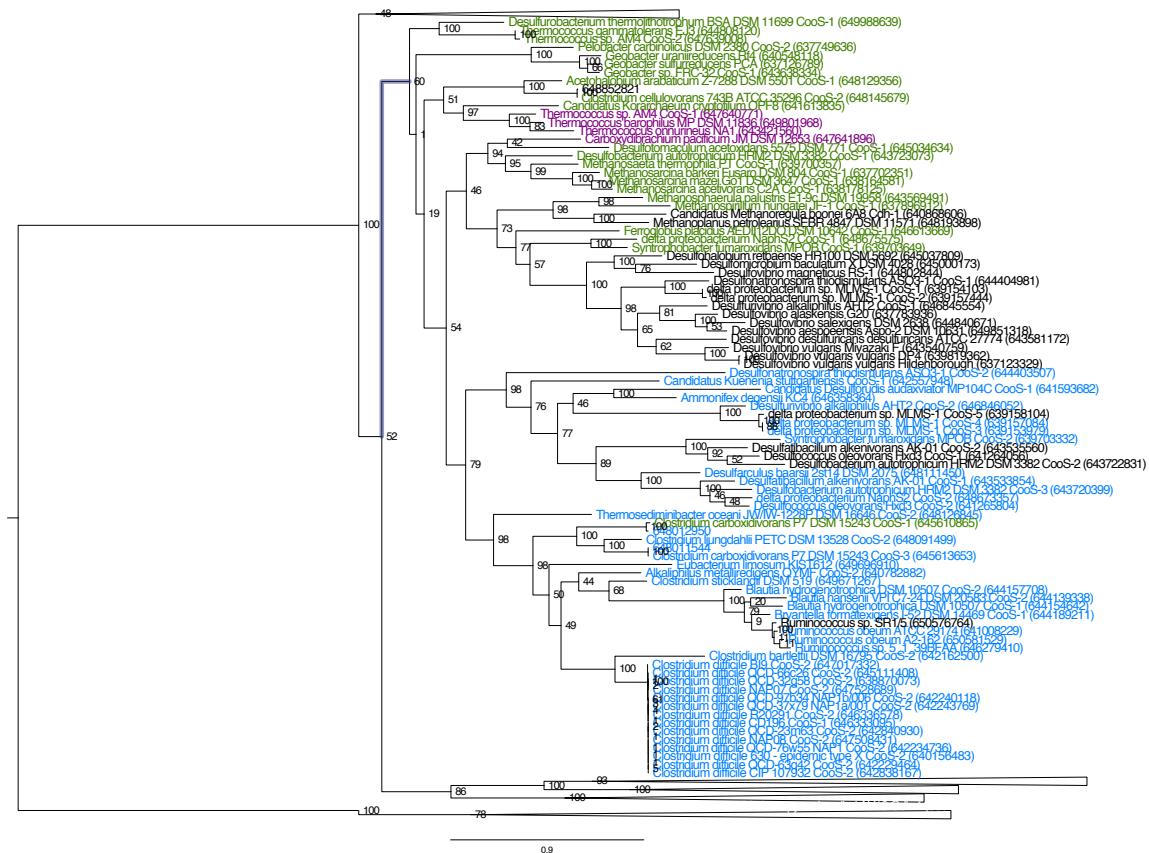
Clade C



Clade D



Clade E



Clade F

